

Georgia Department of Transportation Quality Control and Quality Assurance Program

Revised: May 14, 2008

(Road Design, Urban Design, Consultant Design, Field Districts)

The Georgia Department of Transportation hereby implements the following Quality Control and Quality Assurance Program to ensure that the engineering, design, plans and cost estimates provided by the Design Offices meet or exceed established quality standards. The Department accepts sole responsibility for the quality of the engineering, design, plans and cost estimates developed by the engineers within our Design Offices, and understands that our engineers are held accountable for such. In support of this QC/QA Program, we are committed to the application of established design policies, guidelines, and processes developed and published by the Georgia Department of Transportation (GDOT), the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA), the National Highway Institute (NHI), the Transportation Research Board (TRB), and the National Cooperative Highway Research Program (NCHRP). In addition, we are committed to recruiting qualified engineers and supporting the professional development of those engineers including providing fundamental training in the engineering disciplines of: Highway Capacity and Traffic Studies, Geometric Design of Roadways, Highway Hydraulics and Hydrology, and Pavement Design.

The following QC/QA program also takes into consideration project management activities and the decision making process that is applied in the development of project deliverables. This QC/QA program is in addition to any current QC/QA procedures and publications that are in use by the Department such as, but not limited to, the Plan Development Process (PDP), Plan Presentation Guide (PPG), Electronic Data Guidelines (EDG), the Field Plan Review Process (PFPR, FFPR), and the R/W Plans and Final Plans Checklist.

Purpose: The purpose of this QC/QA Program is to:

- Define the components of Quality Control and Quality Assurance required to develop roadway design projects.
- Define the responsibilities of the Lead Engineer, Project Manager, Assistant Office Head, and Office Head.
- Define the project phases and frequency of practicing Quality Control and Quality Assurance activities.
- Define the methods of documenting QC/QA events/reviews and individual accountability.
- Prevent errors from being introduced to the engineering, design, plans and cost estimates.
- Ensure errors are detected and corrected as early as possible.
- Identify and eliminate the causes of errors.
- Identify individuals and methods of best Quality Control practices and apply those methods uniformly across the Design Groups.

Responsibilities: **Quality Control** is the responsibility of the Assistant Design Group Manager/Squad Leader (also referred to as the Lead Engineer), and Design Group Manager/District Design Engineer (also referred to as the Project Manager or Senior Engineer). **Quality Assurance** is the responsibility of the Assistant Office Head/District Preconstruction Engineer and the Office Head/District Engineer.

Georgia Department of Transportation

Quality Control and Quality Assurance Program

Revised: May 14, 2008

Quality Control (QC): Refers to the daily processes/practices/checks in place to control the quality of the engineering, design, plans and cost estimates as they are being developed. This includes such activities as providing constant training and supervision of subordinate design engineers by the Lead Engineer and Project Manager, providing clear decisions and directions to subordinate design engineers, the immediate review of completed activities for accuracy, completeness, and attention to detail, and immediate and accurate documentation of all decisions, assumptions, and recommendations.

The Department's formal Plan Development Process (PDP) establishes the general sequence of activities and events required to control the quality of a road design project throughout its development. It is the responsibility of the Project Manager and Lead Engineer to ensure that design activities and decisions are being accomplished at the appropriate time in the process and according to established quality standards. This includes the accurate practice of transportation engineering and design, use and interpretation of design policy and guidelines, use of engineering software applications required to analyze and support calculations and decisions, presentation of plan data, and documentation of all decisions and supporting design data.

Components of Quality Control:

1. Print the 3 PDP Flow Charts and develop a "Work Flow Plan" and "Man-Hour-Estimate".
<http://www.dot.ga.gov/doingbusiness/PoliciesManuals/roads/Pages/OtherResources.aspx>
2. Develop and maintain clean and organized Project Correspondence Files for documenting decisions and supporting project data. At a minimum, the project correspondence file structure and plan record should include the following.
 - 📁 Project Programming Document, Project Justification/Need & Purpose
 - 📁 QC/QA Record
 - 📁 Project Concept Report
 - 📁 Concept Layout
 - 📁 Project Cost Estimates (Man-Hour-Estimate, B/C, PE, ROW, UTL, CST)
 - 📁 Value Engineering Report, Responses, and Implementation
 - 📁 Notice of Location & Design (L&D)
 - 📁 Environmental Document
 - 📁 Public Hearing Display(s) and Comments/Responses
 - 📁 Internal Letters of Transmittal
 - 📁 External Letters of Transmittal
 - 📁 Project Email Communications and Telephone Messages
 - 📁 Project Design Data Book
 - 📁 Highway Capacity Analysis and Traffic Studies
 - 📁 Highway Hydraulics/Hydrology Studies and Drainage Design Calculations
 - 📁 Soil Survey and Pavement Evaluation Report
 - 📁 Approved Pavement Design
 - 📁 Intersection Sight Distance Studies
 - 📁 Design Exceptions & Variances
 - 📁 Field Plan Review Report (PFPR/FFPR) and Responses
 - 📁 Complete ½ size sets of "Right-of-Way Plans" and "Construction Plans".
 - 📁 Consultant Contract(s) and correspondence

Georgia Department of Transportation

Quality Control and Quality Assurance Program

Revised: May 14, 2008

Components of Quality Control (continued):

3. Develop and constantly maintain a Project Design Data Book (see Chapter 6, PDP).
4. Conduct frequent Project Team Meetings to review scope items, discuss and resolve design related issues, assign deadlines, and monitor progress. Quality Control of the plans and cost estimates require early and constant coordination with the Project Team: Planning, OFM, Environmental, Field Surveys, Geotechnical, Bridge Design, Utilities, Traffic Safety & Design, Right-Of-Way, and Construction.
5. Request “QA Review of State Waters and Stream Buffer Delineations”. Upon receiving Database Mapping, the designer shall plot roll-plots of the project alignment with all topo drainage features displayed. The designer shall mark all USGS blue-line streams on the roll-plots with blue highlighter, all existing topo drainage features with yellow highlighter, and all streams and buffers previously identified by the ecologist with blue and orange highlighters respectively. The roll-plots shall be submitted to the Office of Environment/Location for QA review with cover letter (Appendix B) attached.
6. Request Constructability Review. During preliminary design, the Project Manager is responsible for holding a Constructability Review with the District Construction Engineer. The meeting should be scheduled once the horizontal and vertical geometry has been established, the initial cross sections are available, and SUE survey data has been received (for SUE projects). The purpose of the meeting is to identify and resolve issues with staging and constructability before the geometric design of the project is completed and Right-Of-Way Plans are developed (see PDP, Chapter 6; Constructability Review in Preliminary Design).
7. Develop “Action Plans” to resolve design related issues/delays with Project Team Members. Action Plans are emailed to the appropriate Project Team Members. The Action Plan should:
 - a. Begin with a brief history of the project or issue.
 - b. Clearly define the required action item(s).
 - c. Identify the individual(s) responsible for delivering the action item.
 - d. State the date when the action item is due.
 - e. Follow-up, close-out action items, update, and notify Project Team Members.
8. Provide constant formal training (Practical Design Training) to subordinate design engineers in the following engineering disciplines. Training will involve discussion of the fundamental engineering principles, the current applicable design policy and guidelines, and hands-on practice of the required calculations and use of the design software.
 - a. Highway Capacity Analysis and Traffic Studies
 - b. Geometric Design of Roadways
 - c. Highway Hydraulics and Hydrology
 - d. Pavement Design
9. Application of established Design Policies and Guidelines. The GDOT Design Policy Manual is the primary resource for design policies and guidelines required by the Georgia Department of Transportation. A complete listing of all design publications can be found within the online version of the GDOT Design Policy Manual at the following link:
<http://wwwb.dot.ga.gov/dpm/index.html>

Georgia Department of Transportation

Quality Control and Quality Assurance Program

Revised: May 14, 2008

Components of Quality Control (continued):

10. Application of Design Software (see R.O.A.D.S. webpage for downloads)

Highway Capacity and Traffic Studies

- HCS+ (Highway Capacity Software by McTrans) – implements the 2000 HCM.
- SYNCHRO – Traffic Simulation Modeling – optimizing traffic signal timing.
- CORSIM – Traffic Simulation Modeling – combined signal and freeway systems.

Geometric Design of Roadways

- MicroStation J (Bentley) – Computer Aided Drafting & Design (CADD)
- CAiCE/Autodesk (current), INROADS/Bentley (future) – Civil Design Software.
- AUTOTURN – Automated Vehicle Turning Specifications and Geometry

Highway Hydraulics and Hydrology / Drainage Design / Erosion Control

- Storm CAD (Haestad) – Longitudinal drainage system design.
- Flow Master (Haestad) – Hydraulic calculator for gutter spread, spacing inlets, sizing pipes, and open channel flow.
- Culvert Master (Haestad) – Culvert Design
- HY8 (FHWA) – Culvert Design
- HEC-RAS (COE) – Stream Modeling Software, primarily for bridge culverts that require FEMA coordination.
- Pond Pac (Haestad) – Design of Detention Ponds and Water Quality Ponds.
- Sediment Basin Program (GDOT) – Design of sediment basin and spillway.
- Ditch Protection (HEC 15) – evaluate channel lining protection options.

Pavement Design

- WIN_APD (Version B.12.01.01) – Asphalt Pavement Design.

Miscellaneous

- Deed Writer Program (GDOT) – generate parcel deed defined from the Civil Software right-of-way and easement chains.
- Detail Estimate Program (GDOT) – designer's final construction cost estimate.

11. Immediate and constant review of completed design activities developed by subordinate design engineers for accuracy, completeness, and attention to detail.

12. Application of Electronic Data Guidelines and Plan Presentation Guidelines. The EDG and PPG are managed by committee chaired by the Design Services Manager in the Office of Road Design. The EDG and PPG can be found on the R.O.A.D.S webpage at the link below.

<http://www.dot.ga.gov/doingbusiness/PoliciesManuals/roads/Pages/Committee.aspx>

Georgia Department of Transportation Quality Control and Quality Assurance Program

Revised: May 14, 2008

Quality Assurance (QA): Refers to the formal high-level review of the project plans and cost estimates by an experienced engineering manager at strategic points in the plan development process to ensure and certify that the plans and cost estimates meet established quality standards and provide for appropriate flexibility and cost savings. Essentially, quality assurance is the process of enforcing quality control standards at strategic points in project development. Quality Assurance is the responsibility of the Office Head and the Assistant Office Head. A series of QA Reviews are conducted by the Assistant Office Head during project development with the support of the Project Manager, consultant (if applicable), the Lead Engineer, and appropriate members of the Project Team. At a minimum, a QA Review is required at the following milestones/strategic points in the plan development process.

1. Initial Programmed Cost Estimates (PE, ROW, CST)
2. Concept Review
3. Geometric Review
4. Preliminary Plans Review (**QA Stamp required**)
5. Right Of Way Plans Review
6. FFPR Plans Review (**QA Stamp required**)
7. Final Plans Submission Review.

It is the responsibility of the Assistant Office Head, responsible for providing oversight to the Project Manager, to schedule the QA Review Meetings with the required panel members. The Project Manager and/or Lead Engineer shall provide each panel member with a copy of the reports and plans NLT a week prior to the review meeting in order to adequately prepare for the meeting.

- **Consultant Projects:** Projects developed by consultant engineering firms, and under the oversight of GDOT, shall be processed through these QA Review procedures as well. Contractually, consultants are required to practice and document an internal Quality Control and Quality Assurance Program. Under no circumstance does a QA Review by GDOT release the consultant from their contractual responsibilities involving QC/QA or from professional liability involving the engineering, plans, and cost estimates, or damages from errors and omissions in the plans.

QC/QA Documentation and Accountability:

For each project, a hardcopy record of QC and QA activities shall be maintained in one location by the QC/QA team (Lead Engineer, Project Manager, Assistant Office Head, and Office Head). A folder named, "**QC/QA Record**" shall be placed in the front-end of the Project Correspondence Files for each project. See Appendix A of this program for form titled QC/QA Record. All QC and QA activities shall be recorded on this form throughout project development. This record is not meant to contain detailed comments about design issues discovered, but to document that QC and QA checks/reviews/events have occurred for critical design activities and to ensure individual accountability throughout project development. This includes, but is not limited to, recording activities such as:

- QC - Periodic review of the Project Design Data Book for completeness and accuracy.
- QC - Constant review of design calculations and studies conducted by subordinate design engr.
- QC - Review of all software output results developed by subordinate design engineers.
- QA - When QA requests are sent to Project Team Members for action.
- QA – Formal QA Reviews of reports, plans, and cost estimates, conducted by the Assistant Office Head.

**Georgia Department of Transportation
Quality Control and Quality Assurance Program**

Revised: May 14, 2008

QC/QA Documentation and Accountability (continued):

The QC/QA folder shall also contain major recommendations resulting from the intermediate QA Reviews conducted by the Assistant Office Head and Office Head. Plans undergoing a QA review shall be signed and dated by the Assistant Office Head according to the directions below.

QA Stamp: During the QA Review for “Preliminary Plans Review” and “FFPR Plans Review”, each plan sheet within the plan-set shall be stamped with the red stamp below and signed and dated by the responsible parties for documentation and accountability. This record set of plans (QA Review) should be retained until after the project has been constructed and “Final Acceptance” has been received.

Assistant Office Head →	Checked.....Date.....
Project Manager/Lead Engineer →	Backchecked.....Date.....
Design Engineer →	Corrected.....Date.....
Project Manager/Lead Engineer →	Verified.....Date.....

**Georgia Department of Transportation
Quality Control and Quality Assurance Program**

Revised: May 14, 2008

Component of Quality Assurance:

1. Initial Programmed Cost Estimates (PE, ROW, CST)

Panel: Office Head, Assistant Office Head, Project Manager, Lead Engineer

Cycle Time: Hold meeting within one month of receiving project assignment from the Director of Preconstruction.

Immediately after a project is assigned to the Design Office, all initial cost estimates related to the project shall be reviewed for consistency with the Project Justification, Logical Termini, and proposed scope provided by the Office of Planning or Office sponsoring the project. This includes costs associated with Preliminary Engineer, potential reimbursable Utility Relocations, required Right-Of-Way, Construction, and Benefit/Cost Analysis if applicable. Initial cost estimates shall be reviewed for consistency with proposed scope of work and complexity of project, constructability, current price trends with construction items, and current regional property values. If applicable, revised cost estimates shall be submitted to Engineering Services, OFM, and the Project Team immediately.

Georgia Department of Transportation

Quality Control and Quality Assurance Program

Revised: May 14, 2008

Component of Quality Assurance:

2. Concept Review

Panel: Office Head, Assistant Office Head, Project Manager, Lead Engineer

Cycle Time: Hold meeting within Four (4) weeks, but no later than two (2) weeks prior to distributing the draft concept report (for initial concept meeting or concept team meeting) to other offices according to the PDP guidelines.

At a minimum, the Concept Layout and Draft Concept Report will be evaluated for compliance and consistency with the following elements:

- ☐ Consistent with Need & Purpose
- ☐ Consistency of proposed design with established design policy (GDOT, AASHTO, FHWA).
- ☐ Traffic Volumes
- ☐ Speed Design
- ☐ Access Control
- ☐ Clear Zone requirements
- ☐ Typical Sections
- ☐ Proper consideration for Environmental Resources
- ☐ Safety and impacts to public (including consideration of accident history along the project corridor).
- ☐ Consideration of pedestrian traffic and bicycles.
- ☐ Cost effectiveness (use of V.E. study if applicable).
- ☐ **Review of cost estimates (PE, ROW, UTL, CST).**
- ☐ Constructability considerations (including staging, detours, road closures, access, etc.).
- ☐ Structural considerations (bridges, culverts, walls, sound barriers, etc.).
- ☐ Vertical clearances where applicable are met.
- ☐ Conformity with STIP and/or MPO models.
- ☐ Determine if other reasonable and feasible alternatives should be considered.
- ☐ Ensure coordination with all stakeholders, especially local governments, and civic groups, utility companies, FHWA for Full Oversight projects, other federal and state agencies, railroad company etc., as applicable.
- ☐ Design Exceptions and Variances are addressed.
- ☐ Review roadway geometry to ensure proposed lane configuration is operationally efficient based on the project traffic volumes and to evaluate potential impacts from surrounding or anticipated residential and/or commercial developments in the project area.
- ☐ Review Design Data book to ensure that the project specific design criteria is appropriate, such as: design vehicle, maximum SE rate, design speed, etc. for mainline and all side roads.

Action:

1. Recommendations resulting from the panel discussions or reviews must be incorporated into the concept development for the project by the project designer or design team prior to distributing draft concept report to other parties.
2. Document and file in QC/QA Record folder, a copy of the recommendations, any actions taken by the designer(s) regarding these recommendations and any major decisions or deviations from standard practice.

**Georgia Department of Transportation
Quality Control and Quality Assurance Program**

Revised: May 14, 2008

Component of Quality Assurance:

3. Geometrics Review

Panel: Assistant Office Head, Project Manager and Project Designer

Cycle Time: Within two (2) weeks of completing the preliminary proposed alignments and other roadway geometrics.

- ☐ Review proposed horizontal and vertical alignments to ensure compliance with design speed and AASHTO criteria for geometric design.
- ☐ Review vertical and horizontal clearances with respect to bridge structures, drainage structure, and other rigid fixed structures.
- ☐ Review the effects of geometric design on environmental resources.
- ☐ Review the effects of geometric design on driveway access along the alignment.
- ☐ Review the effects of geometric design with respect to constructability (earthwork staging, maintenance of traffic, bridge construction, utilities, etc...)
- ☐ Review Project Design Data book and randomly check the accuracy of calculations.

Action:

- Approved recommendations by the review panel above must be incorporated into the technical development for the project by project designer or design team
- Document and file in QC/QA folder, a copy of the recommendations, any actions taken by the designer(s) regarding these recommendations and any major decisions or deviations from standard practice.

**Georgia Department of Transportation
Quality Control and Quality Assurance Program**

Revised: May 14, 2008

Component of Quality Assurance:

4. Preliminary Plans Review

Panel: Project Manager and Assistant Office Head

Cycle time: Six weeks (6) and NLT Two (3) weeks before requesting PFPR.

- ☐ Review preliminary plans to ensure design features are consistent with approved concept report and/or revised concept report.
- ☐ Ensure roadways geometrics and features are consistent with typical sections.
- ☐ Intersection designs meet AASHTO Green Book and GDOT guidelines and policies, and is appropriate for the applicable design vehicle.
- ☐ Construction limits are consistent with typical sections and proposed horizontal and vertical alignments.
- ☐ Verify that horizontal and vertical curves meet required speed design and sight distance criteria.
- ☐ Survey and mapping information are accurately depicted.
- ☐ Proposed r/w and easements are adequate and reasonable.
- ☐ Design features include appropriate ADA standards as necessary.
- ☐ Evaluate the constructability of proposed design and the feasibility of staging plans. Detours necessary?
- ☐ Coordination of all plan documents and reports provided by the various supporting offices and ensuring that the plans have incorporated all recommendations from the other offices.
- ☐ Ensure that erosion control requirements are met.
- ☐ Plans meet the Plan Presentation, Electronics Guidelines.
- ☐ Recommendations from Soil Surveys have been incorporated.
- ☐ USTs identified.
- ☐ Environmental resources are identified.
- ☐ Access issues are considered.
- ☐ Ensure drainage issues are considered. Outfalls, R/W for adequate erosion control.
- ☐ Review project schedule to ensure project is on track to meet the established program dates.
- ☐ Update project cost estimate.

Action:

- Approved recommendations by the review panel above must be incorporated into the technical development for the project.
- Document and file in QC/QA folder, a copy of the recommendations, any actions taken by the designer(s) regarding these recommendations and any major decisions or deviations from standard practice.

QA Stamp Required:

Assistant Office Head →	QA REVIEW
Project Manager/Lead Engineer →	Checked.....Date.....
Design Engineer →	Backchecked.....Date.....
Project Manager/Lead Engineer →	Corrected.....Date.....
	Verified.....Date.....

**Georgia Department of Transportation
Quality Control and Quality Assurance Program**

Revised: May 14, 2008

Component of Quality Assurance:

5. Right of Way Review

Panel: Project Manager and Assistant Office Head

Cycle time: Two (2) weeks before submitting plans to Right of Way Office.

- ☐ Verify and ensure that Location and Design report is prepared and approved.
- ☐ Review proposed r/w and easements to ensure adequacy and reasonableness. See GDOT Design Policy Manual, Chapter 6.10, Right Of Way Controls.
- ☐ R/W plans are developed in accordance with R/W guidelines-(using current R/W guidelines and checklist).
- ☐ All required and appropriate information is indicated on the plans.

Action:

- Project designer or design team will incorporate recommendations from the reviews
- Document and file in QC/QA folder, a copy of the recommendations, any actions taken by the designer(s) regarding these recommendations and any major decisions or deviations from standard practice.

**Georgia Department of Transportation
Quality Control and Quality Assurance Program**

Revised: May 14, 2008

Component of Quality Assurance:

6. FFPR Plans Review

Panel: Project Manager and Assistant Office Head, Independent Designer

Cycle time: Within four (4) weeks and NLT two (2) weeks before requesting FFPR

- ☐ Review final plans to ensure PFPR comments have been adequately addressed
- ☐ Review final plan cover sheet to ensure all required information are indicated on plan sheet.
- ☐ Ensure design parameters are still consistent with approved concept and/or revised concept reports
- ☐ Typical sections and approved pavement design are correctly depicted on the final plans
- ☐ Verify that the projects limits are still consistent with approved STIP and/or amended STIP.
- ☐ Independent Designer will verify that all quantities are properly summarized on summary of quantity sheets and detail estimate sheets
- ☐ Independent Designer will perform a check of drainage summaries, drainage profiles and plans sheets to ensure that all items are properly accounted and summarized and are consistent.
- ☐ Ensure roadway geometrics and features are consistent with typical sections
- ☐ Construction limits are consistent with typical sections and proposed horizontal and vertical alignment.
- ☐ Verify that horizontal and vertical curves still meet required speed design and sight distance criteria.
- ☐ Proposed r/w and easements are still adequate and reasonable
- ☐ Design features include appropriate ADA standards as necessary
- ☐ Evaluate the constructability of proposed design and the feasibility of any staging plans
- ☐ Coordination of all documents and reports provided by the various supporting offices and ensuring that the plans have incorporated all recommendations from these offices (i.e. special provisions, railroad and/or utility agreements, r/w options, etc.)
- ☐ Plans meet the Plan Presentation Guidelines
- ☐ Ensure status of environmental document (to ensure document is current or if re-evaluation is required)
- ☐ Update the project cost estimate
- ☐ Review schedule to ensure project is on track to meet the established program dates

Action:

- Project designer or design team will incorporate recommendations from the reviews
- Document and file in QC/QA folder, a copy of the recommendations, any actions taken by the designer(s) regarding these recommendations and any major decisions or deviations from standard practice.

QA Stamp Required:

Assistant Office Head →	Checked.....Date.....
Project Manager/Lead Engineer →	Backchecked.....Date.....
Design Engineer →	Corrected.....Date.....
Project Manager/Lead Engineer →	Verified.....Date.....

**Georgia Department of Transportation
Quality Control and Quality Assurance Program**

Revised: May 14, 2008

Component of Quality Assurance:

7. Final Plans Submission Review

Panel: Project Manager, Design Engineer, Independent Designer

Cycle time: Within three (3) weeks to two (2) weeks prior to submitting plans to Office of Contracts Administration

- ☐ Project manager will review plans to ensure all FFPR comments have been adequately addressed and any exceptions documented and filed in QC/QA folder.
- ☐ Verify cover sheet shows correct project information, design parameters and all required information.
- ☐ Assemble all project special provisions and permits required.
- ☐ Gather all necessary information as outlined on Designer's Checklist for final plans submission.
- ☐ Independent Designer will perform final verification of all summarized quantities and detail estimate to ensure accuracy and consistency.
- ☐ Assistant Office Head will verify final plans package to ensure completeness within two days prior to submission to contracts administration office.
- ☐ Assistant Office Head will Review schedule to ensure the project is on track as per PDP and programmed dates.
- ☐ Ensure that the Notice of Intent (NOI) is properly completed.
- ☐ Verify that electronic earthwork files have been reviewed for proper format.
- ☐ Update and review final designer's cost estimate.

Action:

- Project designer or design team will incorporate all last minute recommendations from the reviews including comments from the Office Contracts Administration (such as revisions and amendments).
- Copies of comments form Contract Administration and corrective measures taken should be filed in QC/QA folder. Document and file in QC/QA folder, a copy of the recommendations, any actions taken by the designer(s) regarding these recommendations and any major decisions or deviations from standard practice.